

## **A Drive Mechanism**

### **5 Field of the Invention**

The invention relates to a drive mechanism and particularly to a drive mechanism for food handling and cleaning equipment.

### **10 Background to the Invention**

In the food handling industry there is currently available for washing vegetables such as carrots, potatoes, and parsnips equipment which is best be described as a rotary barrel brush washer. This equipment is of recent  
15 conception and was designed as a replacement for existing pressure washers, flatbed washers and standard barrel washers. This new rotary barrel washer combines traditional product agitation of a standard barrel washer with brushes which are formed on shafts that counter rotate. The axes of the shafts supporting the brush bristles are generally aligned to the longitudinal  
20 axis of the barrel and are positioned around the inner periphery of a barrel in which the produce is cleaned.

A difficulty with the new rotary barrel washer is that the environment in which it is used can result in considerable wear to whatever drive mechanism is  
25 incorporated to drive rotation of the plurality of counter rotating shafts on which the brushes are mounted. The environment includes water and dirt washed from the produce and this makes it necessary to adopt a drive which can withstand such conditions.

30 At present, in equipment on the market, a drive motor is provided to drive the rotation of the barrel by way of a chain or V belt.

Two separate drive motors are provided for rotating the shafts on which the brushes are mounted. The two drive motors, through gear boxes, drive chains which rotate the shafts on which the brushes are mounted. The drive motors are mounted, spaced apart on opposite sides of the chassis, so that the chains wrap around sprockets on the ends of the shafts so that at any one time each sprocket is being driven by at least one of the chains.

In an alternative construction a single drive motor has been used and this drives a timing drive belt and a timing slave belt. In this context a slave or wrap belt is a toothed timing belt which wraps round pulleys on the end of the shafts supporting the brushes and is not connected to a motor.

With the chain drive, this requires regular lubrication and regular attention to chain tension to obtain constant speed. The inclusion of two drive motors adds to both manufacturing costs and running costs and doubles the possibility of deleterious matter causing damage during operation. With the timing belt drive, the set up of the timing belts is very critical and time consuming to assemble, to avoid operational problems and premature wear. The cost of the timing belts is also very expensive.

An example of an existing apparatus for peeling vegetables is the invention described in US patent specification no. 4068574. The apparatus mentions that in order to keep the spindles 7 rotating together pulleys 33 are all operably connected by a belt 40 to form a suitable slave drive unit. The drawings with the US patent specification clearly show the pulleys 33 are of the type used with V belts which use friction between the belt and pulley to effect drive. A serious disadvantage of V belts in this application is that, with use, they stretch and therefore do not retain known and reliable tension and drive friction and therefore cannot be relied upon for known load bearing ability.

An object of the invention is therefore to provide a drive mechanism which overcomes all the known problems identified above while providing an

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alternative lower cost drive mechanism for known and new equipment which at least offers a useful alternative choice.

Further objects and advantages of the invention will become apparent from the following description which is given by way of example only.

### Summary of the Invention

According to a broadest aspect of the invention there is provided a drive mechanism for food and produce handling and cleaning equipment incorporating a rotating barrel in which are mounted a plurality of shafts aligned with their longitudinal axes parallel to the longitudinal axis of the barrel, the drive mechanism including a single motor adapted to drive via a V belt drive the shafts which are also linked by a toothed timing belt slave.

According to another aspect of the invention there is provided a drive mechanism for food and produce handling and cleaning equipment incorporating a rotating barrel in which are mounted a plurality of shafts aligned with their longitudinal axes parallel to the longitudinal axis of the barrel, the drive mechanism including a single drive motor adapted to drive via a gearbox and a number of adjacent V-belts at least some of the plurality of shafts, the shafts additionally including toothed pulleys or sprockets driven by a timing belt that ties rotation of all the shafts together to maintain constant rotation of the shafts under the drive of the single drive motor.

Each shaft has a pair of pulleys or sprockets the first of which is driven by the V-belts and the second of which is linked by the timing belt.

The V-belt drive can be by way of a plurality of separate V-belts or a single multi V-belt configured with a plurality of adjacent V shaped surfaces.

The timing belt can be a toothed belt adapted to drive toothed pulleys or sprockets on each shaft.

Further aspects of the invention will become apparent from the following description which is given by way of example only.

## 5     **Description of the Drawing**

An example of the invention will now be described with reference to the accompanying drawing in which:

10         Figure 1 shows a perspective view from one end of an example of rotary barrel washer incorporating an example of drive mechanism according to the invention.

## 15         **Description of the Example**

15         The example of the invention will be described with reference to the drive mechanism being incorporated into a rotary barrel brush washer for vegetables. It is to be appreciated that the drive mechanism can be used in a number of other situations such as for cleaning fruit, shellfish or a variety of  
20         other produce. In such other situations it is acknowledged that the equipment incorporating the drive mechanism will in many respects be different from that shown in the example. The equipment will have the common denominator of requiring a drive mechanism for a plurality of shafts all of which are to be driven at substantially the same constant speed from a single drive motor.

25         In Figure 1 is shown a rotary barrel brush washer which in many respects is similar to the new rotary barrel washer described in the background description above. The rotary barrel washer includes a frame 1 manufactured from appropriate box section steel. The frame supports a barrel and brush  
30         assembly 2 the drive and rotation of which will be described in more detail below.

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At one end of the frame is included a frame assembly 3 on which a drive motor 4 for the barrel is mounted. The drive motor 4 is connected via a gearbox 5 to a drive shaft on which a pulley 6 is mounted and on which a multi vee drive belt is fitted. The multi vee drive belt is adapted to drive rotation of the main drum of the barrel and brush assembly 2.

The frame assembly 3 also supports a drive motor and gearbox assembly 7 for driving the shafts 8 supporting the brush bristles. The shafts 8 are generally aligned to the longitudinal axis of the barrel and are positioned around the periphery of the main drum forming the barrel in which the produce is cleaned. The end of each of the shafts 8 supports a pulley 9 aligned in the same plane as a pulley 10 on the end of a drive shaft 11 of the drive motor and gearbox assembly 7. The end of each shaft 8 also supports a toothed sprocket or gear 12.

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The drive from the pulley 10 to the pulleys 9 is via a number of V-belts 13 which are tensioned by a tensioner assembly 14. A constant rotational speed is maintained on all the shafts 8 by providing a toothed timing belt 15 on the set of toothed sprockets or gears 12.

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In use a separate variable speed control (not shown) can be incorporated on both the brush and barrel drive motors 7 and 4 so that users can tailor the condition of the cleaned end products to suit their initial condition and product type. In this way skin sensitivities are allowed for. This can result in a reduced need for a pre-cleaning system and a completely dirty product direct from a field can be used as the input.

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The frame 1 can also include a means for adjusting the tilt angle of the drum to suit a user's requirements. The machine for a potato cleaning situation has low water consumption. For New Zealand conditions an average user can use 1500 to 3000 gallons of clean water per hour for a 15 tonne per hour cleaning process. A recycling of the water is possible and this can decrease the water required by 80 to 90%.

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The drive mechanism according to the invention therefore includes a single motor adapted to drive via a V belt drive the shafts which are also linked by a toothed timing belt slave.

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The main benefit of the present invention over existing chain driven equipment is there is only one motor, no need to oil or adjust belts on a constant basis, better speed control and quieter running.

10 The main benefit of the present invention over the dual timing belt and timing slave belt is cheaper cost and that the V belts do not have teeth and therefore they are not required to be tensioned, or to have the same set up tolerances as a timing belt drive. Because the slave belt is a timing belt, if a timing belt drive is used it has to be matched exactly with the timing belt slave in tension,  
15 pulley set up and the like which is a time consuming and expensive exercise. If such a set up is not done properly it can lead to premature belt wear and failure. By changing to a V belt drive, the need for the belts to be matched in tension is removed. If the V belts slip it does not affect the timing slave belt in any way. It is much simpler and easier to install and the belts are cheaper.

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The main benefit of the invention over US patent specification no. 4068574 is that the provision of a toothed timing belt results in teeth mechanically attaching and engaging with teeth on the pulley giving a known and reliable power transfer. Reliable dimensional stability is provided because of the  
25 different belt construction of a timing belt. Per mm of width the use of a timing belt gives a much greater ability to transfer load. Use of a V belt does not give sufficient load sharing from one roller to the others because of a lack of traction. This could be overcome by a plurality of V belts side by side but this adds to costs. The provision of a timing belt as a slave increases load sharing  
30 allowing the use of smaller cost effective components.

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Where in the description particular mechanical parts are mentioned it is envisaged that their mechanical equivalents can be substituted as if they were set forth herein.

- 5 Thus by the invention there is provided drive mechanism and particularly to a drive mechanism for food handling and cleaning equipment

A particular example of the invention has been described and it is envisaged that improvements and modifications can take place without departing from  
10 the scope of the attached claims.